

PROJECT NAME  
**OCEANID**

BASED ON  
Cornish OC-1 Optical Compressor

EFFECT TYPE  
Compressor

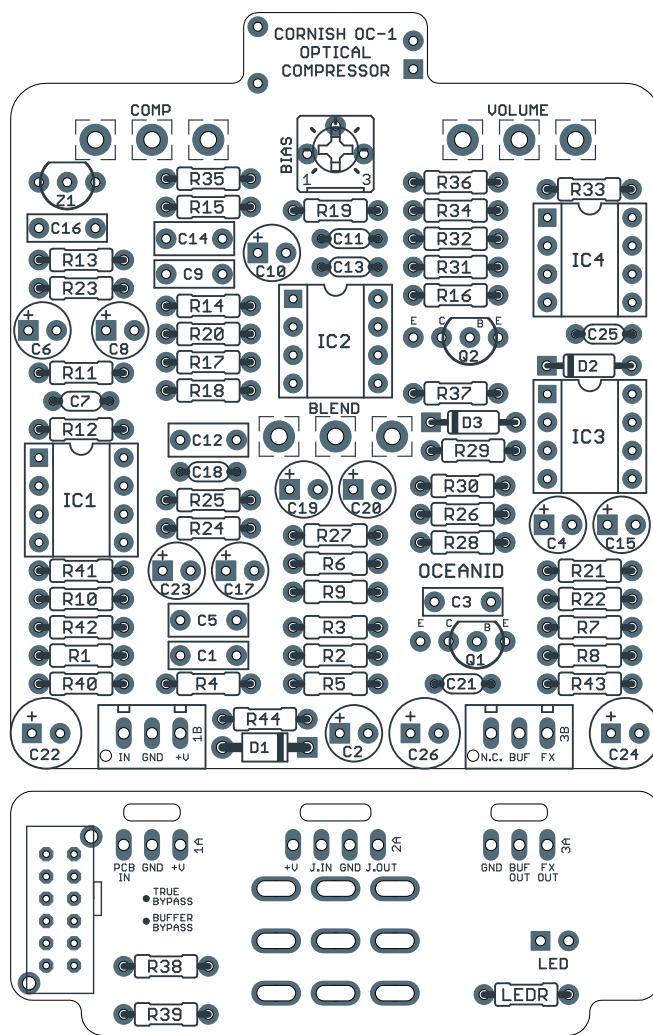
**AION**  
DIY GUITAR EFFECTS

BUILD DIFFICULTY  
Intermediate

DOCUMENT VERSION  
1.1.0 (2020-02-22)

**PROJECT SUMMARY**

Pete Cornish's original optical compressor design features a clean blend and a complex side-chain for envelope detection along with his legendary input buffer.



Actual size is 2.3" x 2.675" (main board) and 2.3" x 0.87" (bypass board).

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## INTRODUCTION

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The Oceanid Optical Compressor is adapted from the Pete Cornish OC-1 Optical Compressor, [traced by Aion FX in 2019](#).

Cornish pedals are best known for being extremely expensive. There are two reasons for this. First, the build quality and reliability is unmatched. Second, the mysterious nature of them, partially due to the fact that the circuit is obscured and partially because of the A-list of clients such as David Gilmour and Brian May.

The OC-1 is a relatively new addition to the Cornish lineup, having been released in 2014. It notably has Paul McCartney listed as an owner.

The OC-1 is indeed an original circuit as Pete Cornish claims, and it bears the marks of careful design, without any clear comparisons to anything else out there. It uses the LDR-to-ground method of volume reduction as seen in early optical limiter circuits like the LA2A, but the methods of generating the LED control voltage from the envelope are unique, and the clean-blend circuit is a little more complex than what you normally see.

The Oceanid is a faithful reproduction of the OC-1 circuit, but with one major addition: an internal slide switch allowing the pedal to be used in true-bypass mode instead of buffered bypass. As with the Klon KTR, the buffered mode is “almost always better”, but with this feature, you can determine for yourself.

## USAGE

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The Oceanid has the following controls:

- **Compression** controls the amount of drive or distortion, which also affects the amount of sustain.
- **Blend** allows the clean signal to be mixed back in, which is especially useful for bass.
- **Volume** sets the overall output level, and is located after the blend control.

## PARTS LIST

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This parts list is also available in a spreadsheet format which can be imported directly into Mouser for easy parts ordering. Mouser doesn't carry all the parts (most notably potentiometers) so the second tab lists all the non-Mouser parts as well as sources for each.

[View parts list spreadsheet →](#)

PART	VALUE	TYPE	NOTES
R1	10M	Metal film resistor, 1/4W	
R2	1k	Metal film resistor, 1/4W	
R3	120k	Metal film resistor, 1/4W	
R4	120k	Metal film resistor, 1/4W	
R5	200k	Metal film resistor, 1/4W	
R6	7k5	Metal film resistor, 1/4W	
R7	10k	Metal film resistor, 1/4W	
R8	51R	Metal film resistor, 1/4W	
R9	1M	Metal film resistor, 1/4W	
R10	1M	Metal film resistor, 1/4W	
R11	10k	Metal film resistor, 1/4W	
R12	10k	Metal film resistor, 1/4W	
R13	10k	Metal film resistor, 1/4W	
R14	1M	Metal film resistor, 1/4W	
R15	8k2	Metal film resistor, 1/4W	
R16	91R	Metal film resistor, 1/4W	
R17	10k	Metal film resistor, 1/4W	
R18	10k	Metal film resistor, 1/4W	
R19	51k	Metal film resistor, 1/4W	
R20	18k	Metal film resistor, 1/4W	
R21	10k	Metal film resistor, 1/4W	
R22	91R	Metal film resistor, 1/4W	
R23	1M	Metal film resistor, 1/4W	
R24	2k2	Metal film resistor, 1/4W	
R25	30k	Metal film resistor, 1/4W	
R26	91k	Metal film resistor, 1/4W	
R27	10k	Metal film resistor, 1/4W	
R28	91k	Metal film resistor, 1/4W	
R29	100k	Metal film resistor, 1/4W	
R30	100R	Metal film resistor, 1/4W	

## PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
R31	1k	Metal film resistor, 1/4W	
R32	15k	Metal film resistor, 1/4W	
R33	10k	Metal film resistor, 1/4W	
R34	100k	Metal film resistor, 1/4W	
R35	47k	Metal film resistor, 1/4W	
R36	3k3	Metal film resistor, 1/4W	
R37	1k	Metal film resistor, 1/4W	
R38	91R	Metal film resistor, 1/4W	
R39	51k	Metal film resistor, 1/4W	
R40	100R	Metal film resistor, 1/4W	
R41	8k2	Metal film resistor, 1/4W	
R42	10k	Metal film resistor, 1/4W	
R43	100R	Metal film resistor, 1/4W	
R44	100R	Metal film resistor, 1/4W	
LEDR	4k7	Metal film resistor, 1/4W	LED current-limiting resistor. Adjust value to change LED brightness.
C1	100n	Film capacitor, 7.2 x 2.5mm	
C2	4.7uF	Electrolytic capacitor, 4mm	
C3	1n	Film capacitor, 7.2 x 2.5mm	
C4	22uF	Electrolytic capacitor, 5mm	
C5	100n	Film capacitor, 7.2 x 2.5mm	
C6	2.2uF	Electrolytic capacitor, 4mm	
C7	470pF	MLCC capacitor, NP0/C0G	
C8	22uF	Electrolytic capacitor, 5mm	
C9	100n	Film capacitor, 7.2 x 2.5mm	
C10	4.7uF	Electrolytic capacitor, 4mm	
C11	220pF	MLCC capacitor, NP0/C0G	
C12	470n	Film capacitor, 7.2 x 3mm	
C13	220pF	MLCC capacitor, NP0/C0G	
C14	470n	Film capacitor, 7.2 x 3mm	
C15	22uF	Electrolytic capacitor, 5mm	
C16	100n	Film capacitor, 7.2 x 2.5mm	
C17	2.2uF	Electrolytic capacitor, 4mm	
C18	150pF	MLCC capacitor, NP0/C0G	
C19	22uF	Electrolytic capacitor, 5mm	
C20	4.7uF	Electrolytic capacitor, 4mm	

## PARTS LIST, CONT.

PART	VALUE	TYPE	NOTES
C21	100n	MLCC capacitor, X7R	Power supply filter capacitor.
C22	100uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C23	47uF	Electrolytic capacitor, 5mm	Voltage reference filter capacitor.
C24	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
C25	220n	MLCC capacitor, X7R	Power supply filter capacitor.
C26	220uF	Electrolytic capacitor, 6.3mm	Power supply filter capacitor.
D1	1N5817	Schottky diode, DO-41	
D2	1N914	Fast-switching diode, DO-35	
D3	1N914	Fast-switching diode, DO-35	
Z1	LM4040-5.0	Voltage reference, TO-92	Full part number is LM4040CIZ-5.0. A 1N4733A zener diode can be used instead; see build notes for details.
Q1	2N5088	BJT transistor, NPN, TO-92	The original uses BC549C, but 2N5088 is the U.S. equivalent.
Q2	2N5088	BJT transistor, NPN, TO-92	The original uses BC550C, but 2N5088 is the U.S. equivalent.
IC1	TL072	Operational amplifier, DIP8	
IC1-S	DIP-8 socket	IC socket, DIP-8	
IC2	TL072	Operational amplifier, DIP8	
IC2-S	DIP-8 socket	IC socket, DIP-8	
IC3	LM358N	Operational amplifier, DIP8	
IC3-S	DIP-8 socket	IC socket, DIP-8	
IC4	LM358N	Operational amplifier, DIP8	
IC4-S	DIP-8 socket	IC socket, DIP-8	
COMP.	10kC	16mm right-angle PCB mount pot	
BLEND	25kB	16mm right-angle PCB mount pot	
VOL.	100kA	16mm right-angle PCB mount pot	
VACT.	NSL-32	Vactrol/opto-isolator, NSL-32	Make sure this is installed correctly. See build notes.
BIAS	20k trimmer	Trimmer, 10%, 1/4"	Bourns 3362P or equivalent
TB-BUF	4PDT slide	Slide switch, 4PDT	E-Switch EG4208 (4mm lever) or EG4208A (6mm lever)
IN	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X or equivalent.
OUT	1/4" mono	1/4" phone jack, closed frame	Switchcraft 111X or equivalent.
DC	2.1mm	DC jack, 2.1mm panel mount	Mouser 163-4302-E or equivalent.
FSW	3PDT	Stomp switch, 3PDT	
ENC	125B	Enclosure, die-cast aluminum	Can also use a Hammond 1590N1.

# BUILD NOTES

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## NSL-32 precautions

The NSL-32 very frustratingly has its LED marked with a dot on the cathode side rather than the anode, which goes against the convention of nearly every other type of optocoupler. The diagram in the NSL-32 datasheet does show this, but it's easy to miss, and it has been the root cause of several build failures—including ours when we first prototyped the project.

Therefore, when installing the optocoupler, make sure the leg marked with a dot goes in the round pad rather than the square pad. And if the completed effect passes signal but doesn't seem to compress at all, the vactrol orientation is the first thing to check.

In version 1.1 (February 2020), we moved the NSL-32 to the bottom side of the board so there was more space for the DC jack. You can still mount it to the top side if you want, just be mindful of the LED's polarity.

## Transistor selection

The original OC-1 uses BC549C transistors. The pinout on the Oceanid PCB is for the U.S. "E-B-C" convention as used by the 2N3904 and 2N5088. The 2N5088 will operate identically to the BC549C, but if you do want to use the original type, just note that they will not follow the PCB outline. Typically they would need to be rotated 180 degrees, but check the datasheet for your brand as they do vary.

## Setting the bias trimmer

The OC-1 has a trimmer to set the bias of the LED, affecting the LED's brightness in relation to the signal level. This essentially sets the range of the Compression control.

It's not known what parameters are used to calibrate this trimmer. In the original unit that was traced, the trimmer was set at just about 25% rotation (measured 5.68k between pins 1 and 2, with the total trimmer value of 20.78k), so that would be a good place to start.

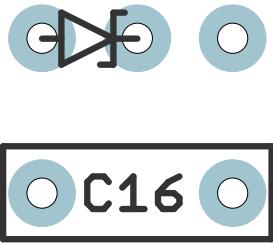
Beyond that, don't worry about it too much! You can tune it by ear, and as long as you like the range of the Compression control and how the pedal responds to your playing, that's what matters.

## Voltage reference

The LM4040 used for Z1 is not something commonly seen in pedals. It functions as a high-precision zener diode that sets the voltage reference at exactly 5.00V regardless of the input signal.

However, since in this circuit the voltage is trimmed down further from that point to set the bias, the high-precision voltage reference is not really necessary. Because of this, if you can't find the LM4040, you can instead use a 1N4733A 5.1V zener diode, wired as shown in the diagram to the right.

The diode will have to be installed standing up in order to fit the pads. The cathode (striped side) of the zener should go to the middle pad while the anode goes to the left-most pad, grounded on the PCB. The right-most pad is not used.

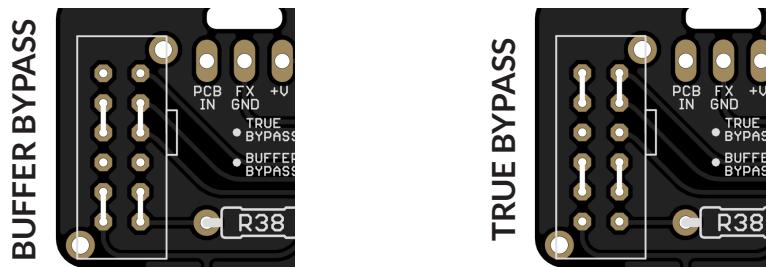


## BUILD NOTES, CONT.

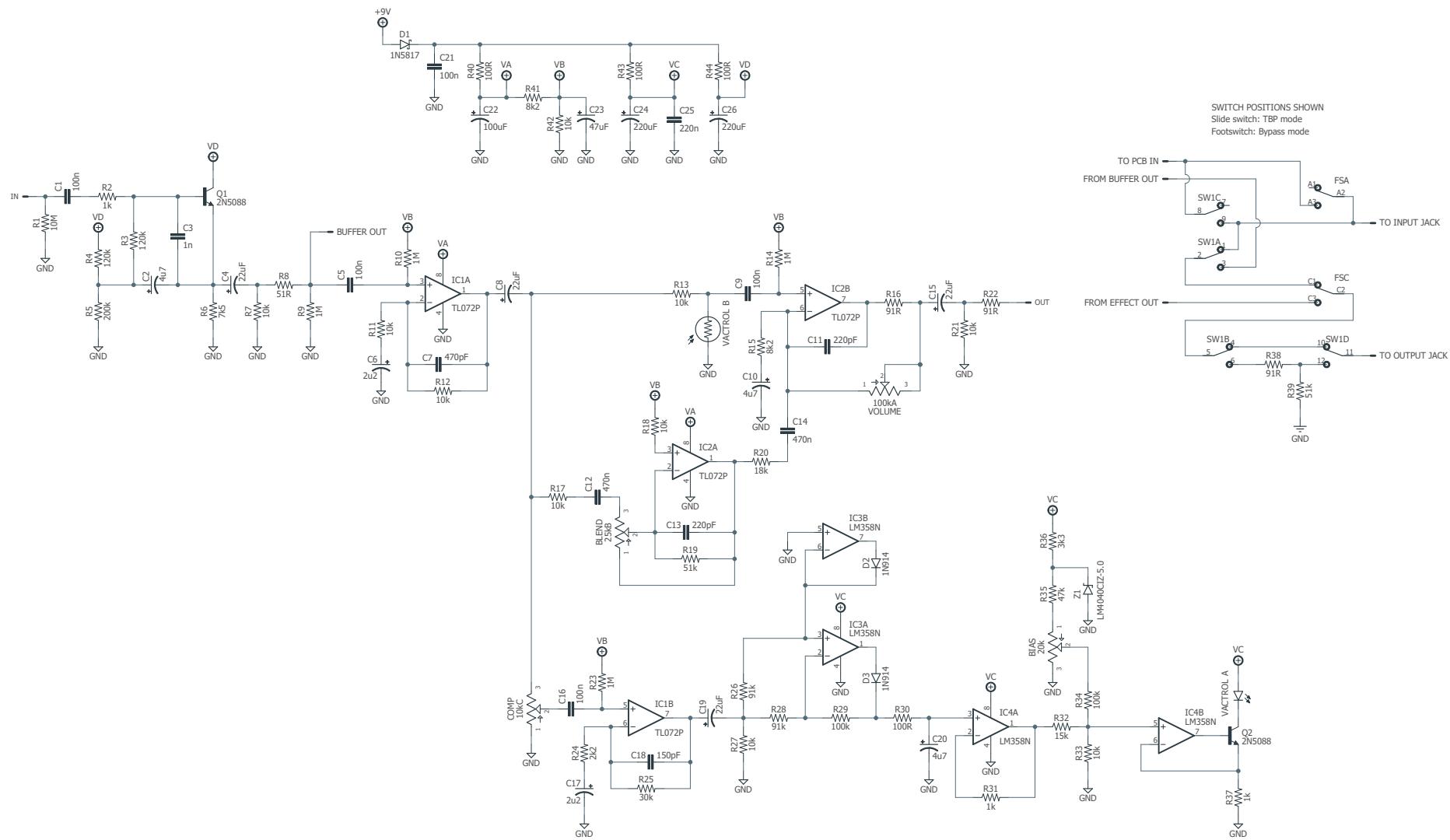
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### Bypassing the true bypass / buffer switch

The E-Switch EG4208 slide switch used for the true bypass/buffer selector is available from Mouser Electronics but may not be accessible to everyone. If you are unable to obtain it, you can hard-wire the switch to either true bypass mode or buffered mode by soldering jumpers to the switch pads.



# SCHEMATIC



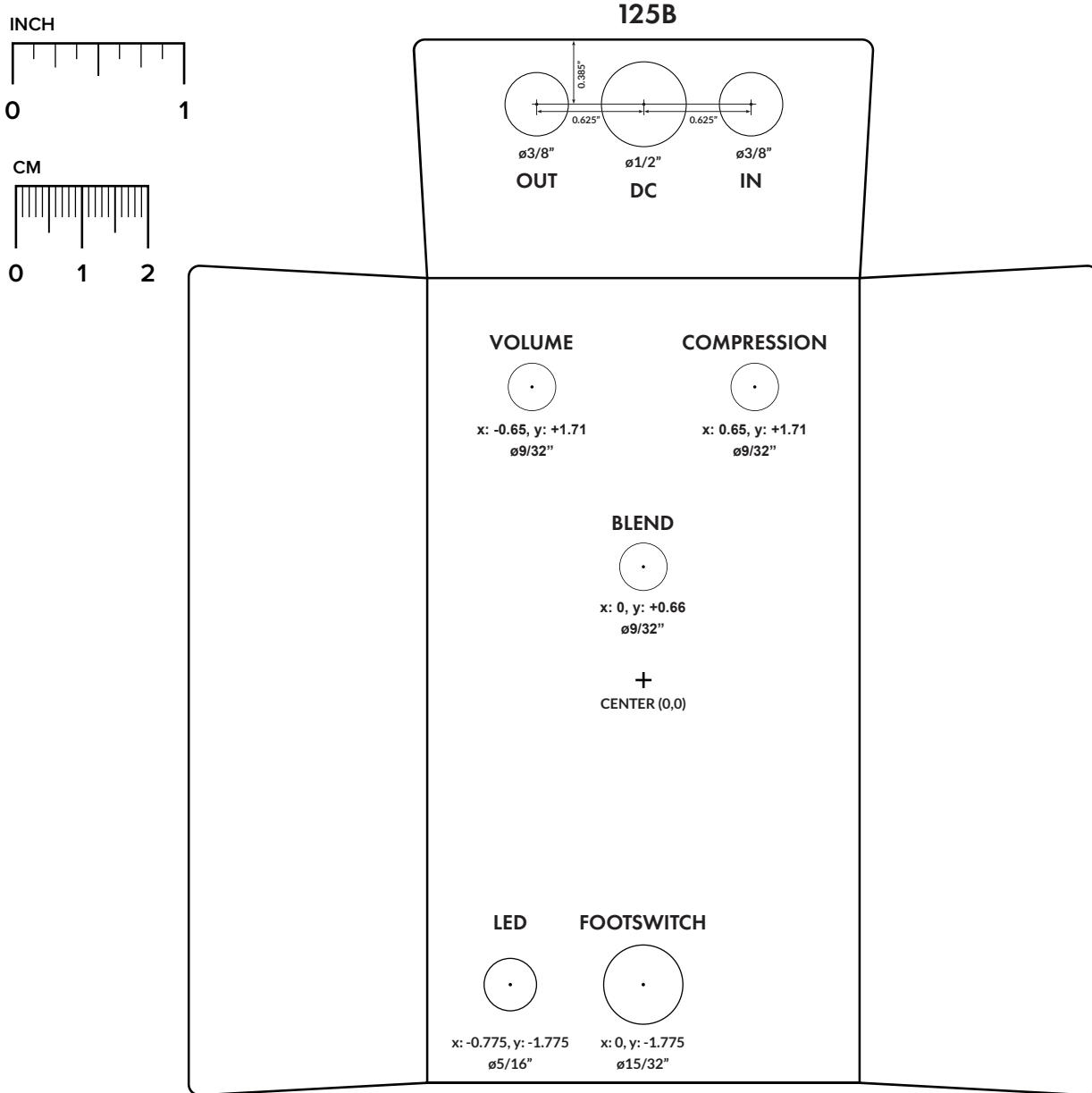
# DRILL TEMPLATE

Cut out this drill template, fold the edges and tape it to the enclosure. Before drilling, it's recommended to first use a center punch for each of the holes to help guide the drill bit.

Ensure that this template is printed at 100% or "Actual Size". You can double-check this by measuring the scale on the printed page.

**Top jack layout** assumes the use of closed-frame jacks like the [Switchcraft 111X](#). If you'd rather use open-frame jacks, please refer to the Open-Frame Jack Drill Template for the top side.

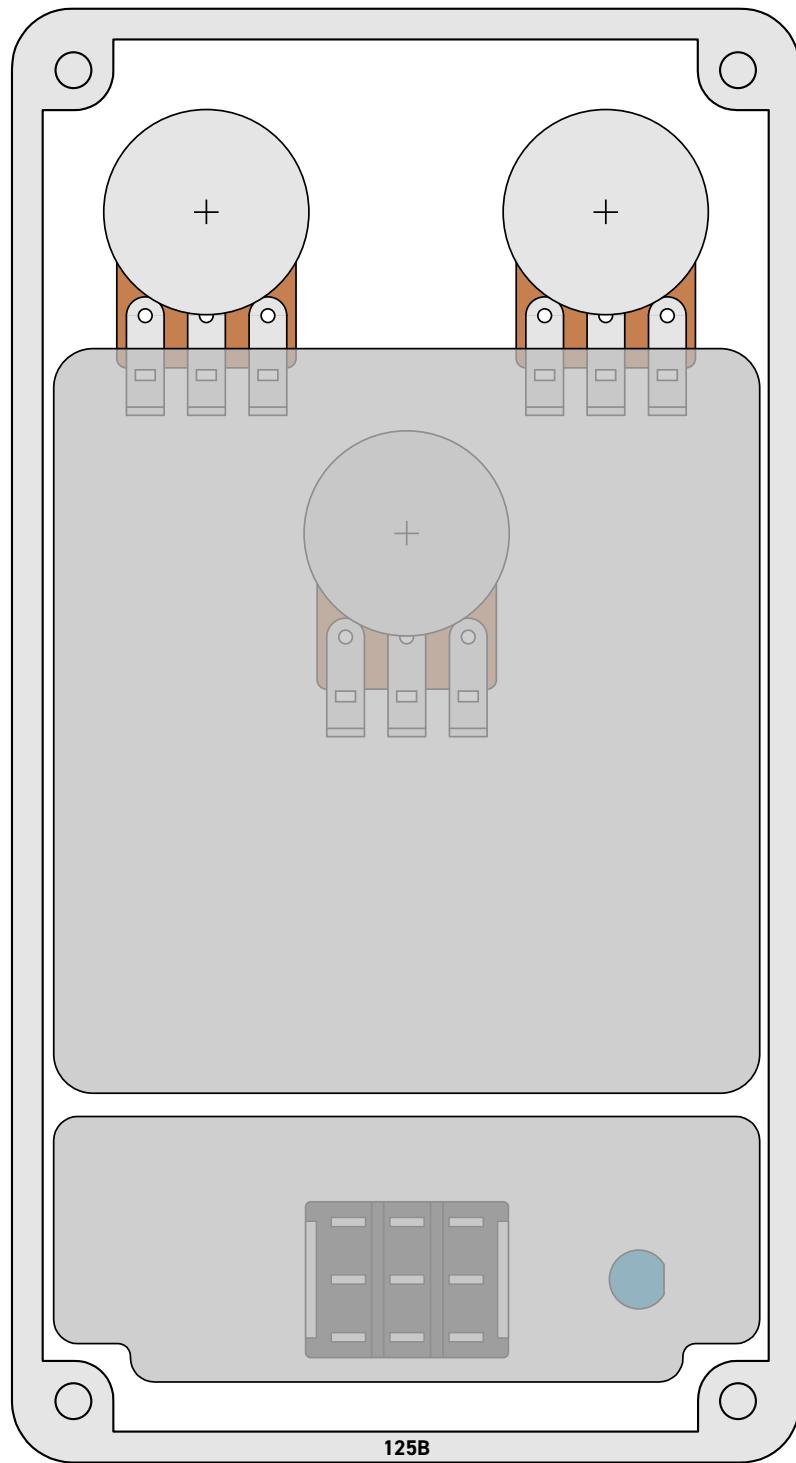
**LED hole drill size** assumes the use of a [5mm LED bezel](#), available from several parts suppliers. Adjust size accordingly if using something different, such as a 3mm bezel, a plastic bezel, or just a plain LED.



## ENCLOSURE LAYOUT

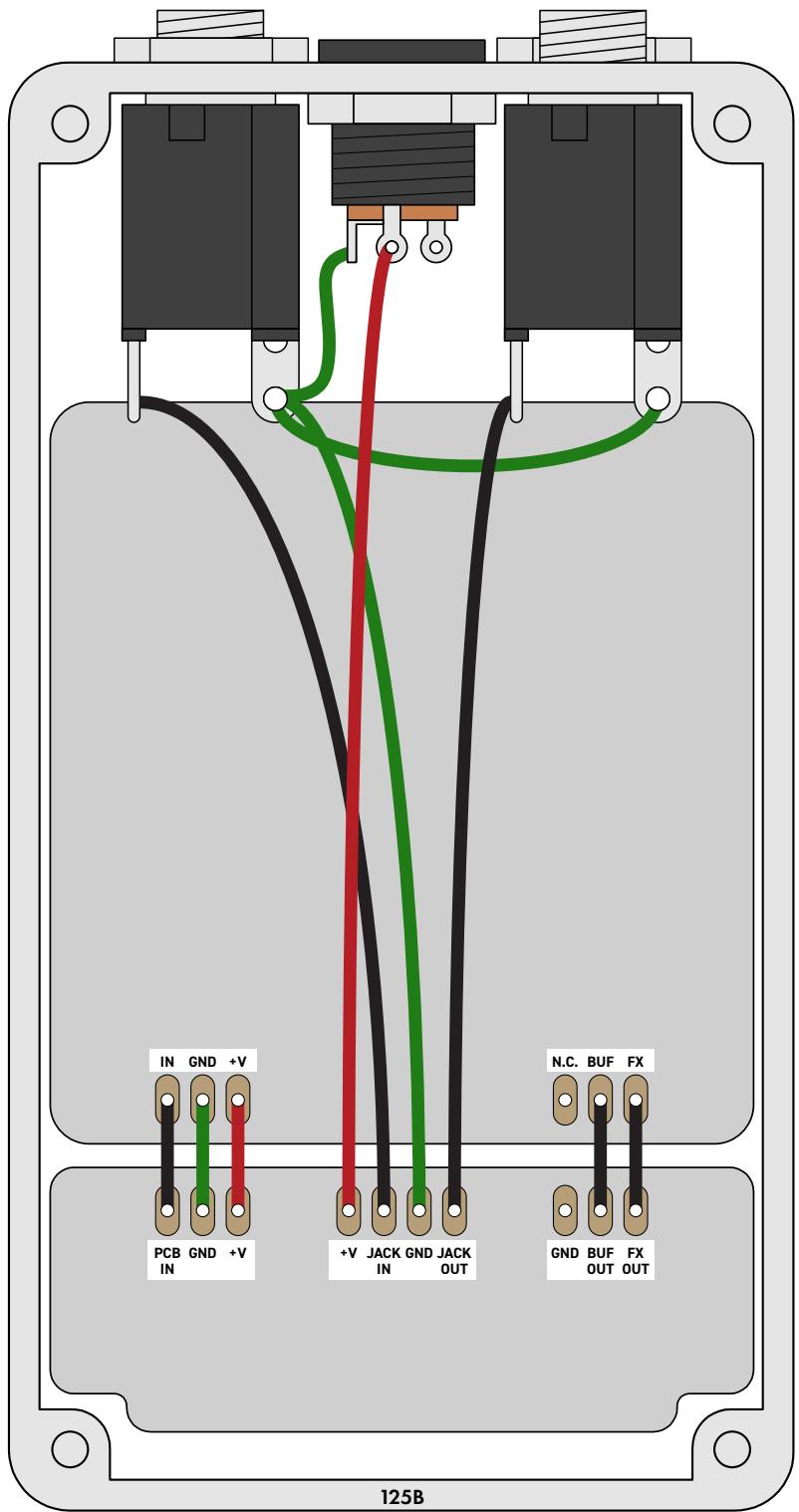
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Enclosure is shown without jacks. See next page for jack layout and wiring.



## WIRING DIAGRAM

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## LICENSE & USAGE

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**No direct support is offered for these projects beyond the provided documentation.** It's assumed that you have at least some experience building pedals before starting one of these. Replacements and refunds cannot be offered unless it can be shown that the circuit or documentation are in error.

**All of these circuits have been tested in good faith in their base configurations.** However, not all the modifications or variations have necessarily been tested. These are offered only as suggestions based on the experience and opinions of others.

**Projects may be used for commercial endeavors in any quantity** unless specifically noted. No attribution is necessary, though a link back is always greatly appreciated. The only usage restrictions are that **(1) you cannot resell the PCB as part of a kit without prior arrangement, and (2) you cannot “goop” the circuit, scratch off the screenprint, or otherwise obfuscate the circuit to disguise its source.** (In other words: you don't have to go out of your way to advertise the fact that you use these PCBs, but please don't go out of your way to hide it. The guitar effects industry needs more transparency, not less!)

## DOCUMENT REVISIONS

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### 1.1.0 (2020-02-22)

Moved optocoupler to the bottom side of the PCB to make more space for the DC jack.

### 1.0.0 (2019-11-15)

Initial release.